

Common Indoor Air Pollutants

Carbon Dioxide

Carbon Dioxide (CO₂) is a non-flammable, colorless, odorless gas, exhibits an acidic taste. It is found in air at concentrations of about 300-450 parts per million (PPM). The build up CO₂ of in the atmosphere is in part caused by deforestation, which reduces the number of trees available to absorb CO₂. CO₂ levels have also increased in the atmosphere due to the burning of fossil fuels in vehicles and industry.

Each gallon of gasoline burned releases about 19.5 pounds of carbon dioxide, of which 5.3 pounds is carbon.

Carbon Dioxide Testing in Indoor Air Quality

CO₂ is a by-product of breathing. Most importantly, CO₂ by itself is not considered a health issue by any of the regulatory agencies until those levels reach as much as 10,000 PPM.

Inadequate ventilation within buildings can result in CO₂ levels above natural concentrations found in ambient air. CO₂ testing can be used to determine the levels of CO₂ in a building. Adequate ventilation is needed to mix outdoor air with indoor air keeping CO₂ levels near natural concentrations

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, tasteless and toxic gas produced as a by-product of combustion. Any fuel burning appliance or internal combustion engine has the potential to produce dangerous levels of CO gas. Examples of CO producing devices commonly in use around the home include:

- Fuel fired furnaces (non-electric)
- Gas water heaters
- Fireplaces and woodstoves
- Gas stoves
- Gas dryers
- Charcoal grills
- Lawnmowers, snowblowers and other yard equipment
- Vehicles

CO inhibits the blood's ability to carry oxygen to body tissues including vital organs such as the heart and brain. When CO is inhaled, it combines with the oxygen carrying hemoglobin of the blood to form carboxy-hemoglobin. Once combined with the hemoglobin, that hemoglobin is no longer available for transporting oxygen. How quickly the carboxy-hemoglobin builds up is a factor of the concentration of the gas being inhaled (measured in parts per million or PPM) and the duration of the exposure. Compounding the effects of the exposure is the

long half-life of carboxy-hemoglobin in the blood. Half-life is a measure of how quickly levels return to normal. The half-life of carboxyhemoglobin is approximately 5 hours. This means that for a given exposure level, it will take about 5 hours for the level of carboxy-hemoglobin in the blood to drop to half its current level after the exposure is terminated.

The following table describes the symptoms associated with a given concentration of COHb (Hb stands for hemoglobin):

<u>% COHb</u>	<u>Symptoms and Medical Consequences</u>
10%	No symptoms. Heavy smokers can have as much as 9% COHb
15%	Mild headache
25%	Nausea and serious headache. Fairly quick recovery after treatment with oxygen and/or fresh air
30%	Symptoms intensify. Potential for long-term effects. Especially in the case of infants, children, the elderly, victims of heart disease and pregnant women
45%	Unconsciousness
50%+	Death

Since one can't easily measure COHb levels outside of a medical environment, CO toxicity levels are usually expressed in airborne concentration levels (PPM) and duration of exposure. Expressed in this way, symptoms of exposure can be stated as follows:

<u>PPM CO</u>	<u>Time (in minutes or hours)</u>	<u>Symptoms</u>
35 PPM	8 hours	Maximum exposure allowed by the U.S. Occupational Safety & Health Administration (OSHA) in the workplace over an eight hour period
200 PPM	2-3 hours	Mild headache, fatigue, nausea and dizziness
400 PPM	1-2 hours	Serious headache, other symptoms intensify. Life threatening after 3 hours
800 PPM	45 minutes	Dizziness, nausea and convulsions. Unconscious within 2 hours. Death within 2-3 hours.
1600 PPM	20 minutes	Headache, dizziness and nausea. Death within 1 hour

3200 PPM	5-10 minutes	Headache, dizziness and nausea. Death within 1 hour
6400 PPM	1-2 minutes	Headache, dizziness and nausea. Death within 25-30 minutes
12,800 PPM	1-3 minutes	Death

As can be seen from the above information, the symptoms vary widely based on exposure level and duration. Symptoms also vary based on the general health and age on an individual. The most significant symptoms in the recognition of carbon monoxide poisoning are; headache, dizziness and nausea. These 'flu like' symptoms are often mistaken for a real case of the flu and can result in delayed or misdiagnosed treatment.

Volatile Organic Carbons (VOCs)

Volatile Organic Compounds (VOCs) are organic chemicals that have a high vapor pressure and easily form vapors at room temperature and pressure. These VOCs are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions.

VOC chemicals are widely used as ingredients in household products. Paints, varnishes, and wax all contain VOC solvents, as do many cleaning, disinfecting, cosmetic, degreasing, and hobby products. Fuels are made up of VOC chemicals. All of these products can release VOC vapors while you are using them, and, to some degree, when they are stored.

Increase ventilation when using products that emit VOCs and wear proper respiratory protective devices. Meet or exceed any label precautions. Do not store opened containers of unused paints and similar materials within the living areas of your home.

Formaldehyde, one of the best known VOCs, is one of the few indoor air pollutants that can be readily measured. Identify, and if possible, remove the source. If it is not possible to remove the source, reduce exposure by using a sealant on all exposed surfaces of paneling and other furnishings. Use integrated pest management techniques to reduce the need for pesticides.

Exposure: Short term health effects include: headache, dizziness, and nausea. Long term health effects vary depending on the specific VOC, but can include cancer. More than 65,000 new organic compounds have been synthesized in the past 25 years. Health effects are known for only a handful of these compounds.

Products containing VOCs are considered hazardous products. Purchase the minimum amount needed to complete a job. Keep the products out of reach or contact from children or pets. To properly dispose of VOC containing products, keep them in the original container, do not mix with any other materials, or take them to the City's [Hazardous Products Center](#).

Mold

Molds produce tiny spores to reproduce. Mold spores continually travel through indoor and outdoor air. When mold spores land on an indoor damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or unaddressed. There is no practical way to eliminate all molds and mold spores in the indoor environment; the best way to control indoor mold growth is to control excessive moisture.

The key to mold control is moisture control. It is important to dry water-damaged areas and items within 24-48 hours to prevent mold growth. If mold is a problem in your home, clean up the mold and get rid of the excess water or moisture. Fix leaky plumbing or other sources of water. Wash mold off hard surfaces with detergent and water, and dry completely. Absorbent materials (such as ceiling tiles & carpet) that become moldy may have to be replaced. (Taken from the EPA web-site)